REMARKS

Applicant appreciates the courtesies extended to his representative, Allan Fanucci, during an interview with Examiner Edna Wong on December 21, 2005. The comments appearing herein are substantially the same as those that were presented and discussed during the interview.

A new abstract is enclosed to overcome the objection of the prior abstract.

The specification has been amended on pages 1, 12, 13 and 14 to overcome the informalities noted on those pages.

Claims 1-20, as amended to correct informalities, appear in this application for the Examiner's review and consideration.

Claims 1-20 were rejected under 35 USC 112, second paragraph, for the reasons set forth on pages 2-3 of the action. In response, applicant has amended claims 1, 4, 13, 16, 18 and 19 to correct these informalities and overcome the rejection.

The claims were rejected as being unpatentable over Japanese patent application 2-301,588 ("the '588 reference") for the reasons set forth on pages 4-11 of the office action. Applicant traverses this rejection.

The present invention relates to the deposition of tin or tin-lead alloys on objects or articles. Of particular interest are electrical components such as surface mounted capacitors and resistors that have metal portions as well as ceramic, glass, or plastic portions. The size of such electronic components has been dramatically reduced in recent years. This reduction in size has made these components significantly more difficult to electroplate. Additionally, many surface mount technology (SMT) components have sensitive ceramic portions which can be damaged by highly acidic or highly alkaline solutions. To avoid this problem, neutral or near neutral pH electroplating solutions are desirable.

Neutral or near neutral pH tin and tin/lead alloy electrolytes that are specifically formulated to be compatible with sensitive ceramic SMTs are described numerous patents as well as the '588 reference that was cited by the Examiner. The formulations described in these patents include complexing agents of components such as citrates, gluconates, ascorbates or pyrophosphates to complex the tin and/or lead and render them soluble in the solutions at the elevated pHs required.

Even so, the prior art solutions mentioned above exhibited a persistent problem of component coupling or agglomeration during electrodeposition. It is quite common when tin or tin alloy plating small components with flat surfaces that the components tend to cluster together during plating. It is not uncommon when barrel plating SMT components that up to 10% of the load may be coupled (i.e., stuck together). Under some conditions, the entire load fuses together in large lumps. The extent of this problem depends on the plating solution composition as well as plating method and geometry of the components. This problem is particularly pronounced in tin-lead alloy electroplating.

The neutral or near neutral pH tin and tin/lead alloy electrolytes that are specifically formulated to be compatible with sensitive ceramic SMTs have some utility, but they do not address the issue of part agglomeration or fusing. This is a particularly significant problem when the parts are of relatively small size. It is this problem that is addressed by the present invention.

The Examiner properly recognized that the primary differences between the present invention and the '588 reference are that applicant is claiming a pH range of about 3.5 to 5.5 and a concentration ratio of complexing agent to metal ion of between about 2:1and 9:1. The comments in the office action that suggest that these important values are obvious are respectfully traversed.

As noted in the office action, the '588 reference does not disclose the presently claimed combination of pH range and concentration ratio. The pH range is not critical in the '588 reference and can range from between 2 and 9. And while a pH of 3.5 to 5.5 is included within that range, there is no importance or criticality attached to it. The examples of the '588 reference have pHs between 6 and 7.5, and this suggests that optimum performance is found when a near-neutral electroplating solution is used. In contrast, the present invention requires a pH of between 3.5 and 5.5 and preferably around 4 for best results. There is no way that a skilled artisan would be led to use this specific range, in particular since it has been found that the baths of the '588 reference were not stable at pHs below 6.

Furthermore, the '588 reference also fails to disclose or teach the importance of the claimed concentration ratio. The office action cites to portions of the reference that disclose wide ranges of complexing agent and tin ions. Even the cited examples of this reference are not relevant, since the complexing agent and tin ions are present at a relatively high concentration

ratio of 10:1 to 20:1 (i.e., 100 g/l to 200g/l of complexing agent and 10 g/l of tin ions). It is believed that the high amount of complexing agent contributes to the poor stability of the bath at pHs that are lower than 6. In particular, the applicant has found that baths with such high metal concentrations at pHs of 6 or above become turbid and tin begins to precipitate. While the baths of the '588 reference may be useful for conducting laboratory tests, they certainly are not suitable for commercial production due to the turbidity and precipitation properties.

The criticality and importance of the claimed pH range and concentrations are discussed in the specification. As applicant was aware of the '588 reference prior to the filing of the present application, the claims were formulated to patentably distinguish the invention from that reference. The deficiencies of the '588 reference are discussed in the present application on page 2. The applicant's oath/declaration attests to the deficiencies of the reference as well as to the distinctions defined by these claims to further support the patentability of the present claims which have been amended only for informalities rather than substance.

Furthermore, the significance of the problem of agglomeration of parts during electroplating cannot be dismissed. This is a source of concern to electroplaters worldwide, and solutions to the problem are actively being sought. The specification addresses this problem, but the applicant has also presented a technical paper at a conference in 2004 to present some of his findings as well as to their explain how to resolve this problem. A copy is attached for the Examiner's review. This paper, entitled MINIMIZING COUPLING OF SMALL PASSIVE COMPONENTS IN THE ELECTROPLATING OPERATION, presented by inventor George Hradil and his colleague, George Federman, establishes the importance of the claimed pH range and concentration ratio in combination with the particular complexing agents defined in claim 1 for avoiding agglomeration of parts during electroplating. This supports the unexpected advantages of the claimed concentration ratio and pH range and further supports the patentability of the present claims.

In view of the above, all rejections based on the '588 reference have been overcome so that that rejection should be withdrawn.

Accordingly, it is believed that the entire application is now in condition for allowance, early notice of which would be appreciated. In the event that the Examiner does not agree that all claims are now allowable, a personal or telephonic interview is respectfully

requested to discuss any remaining issues in an effort to expedite the eventual allowance of this application.

Respectfully submitted,

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Date

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